Postmastectomy Lymphedema

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• **Disturbing lymphedema of the related arm occurs in 20 to 30 per cent of patients after conventional mastectomy.**

Infection, obesity and radiation therapy are the most important contributing factors in the development of swollen arm.

Continuous suction drainage of the wound and the use of antibiotics will reduce the incidence of infection.

Lymphangiosarcoma is a rare fatal complication of postmastectomy lymphedema.

THE MOST COMMON COMPLICATION of conventional mastectomy is swollen arm. Halsted,[2] whose technique for radical mastectomy is still the one most widely employed, was the first to emphasize the importance of this problem and to publish his views concerning the cause. Although it may be anticipated that one of every four women operated upon for mammary cancer will have a definite and permanent swelling of the arm, there has been comparatively little written concerning the cause or the management of this condition.

Holman[3] and associates reviewed 100 cases of radical mastectomy in the clinic at which they worked and reported their results in 1944. Seventy per cent of the patients had definite enlargement of the arm and in 11 per cent the circumference of the mid-portion of the affected arm had increased by more than 6 centimeters. Lobb and Harkins[4] studied a large group of women operated upon by members of one surgical service and found definite swelling in 80 per cent of them. An increase in the circumference of the upper arm of more than 3 centimeters was noted in 22 per cent. More recently (1951) Macdonald and Osman[5] reviewed 140 consecutive cases and reported measurable swelling in 72 per cent while 24 per cent had a disparity of more than 2 centimeters between the two arms.

To determine the incidence of lymphedema in our own experience we examined the records of consecutive patients over a five-year period. We classified the patients into three groups: Those without any demonstrable swelling, those with subclinical swelling, and those with clinical edema (Table 1). The subclinical group included patients whose upper arm measurements indicated an increase in circumference of from 1 to 2 centimeters. Whereas all measurements in Macdonald's study were made 10 cm. below the acromion process, we accepted measurement at the approximate midportion of the upper arm as sufficiently accurate to serve the purpose of this study. Many of the women were unaware of the swelling and those who had observed the slight enlargement were in no way disturbed by it. In the clinical swelling group all patients were aware of disparity in the size of the two arms and most complained of the unsightliness or of the difficulty in passing the enlarged arm through a sleeve. A number were conscious of a sense of heaviness in the arm but only one complained of actual pain. The upper arm measurement in this group indicated an increase in circumference of more than 2 centimeters in all patients.

It was apparent that our observations closely paralleled those reported by investigators in the recent literature. Haagensen[1] decried this high rate of lymphedema following mastectomy and said that in cases in which he personally supervised the postoperative care of such patients, the incidence of swelling was very low. However, a careful analysis of his records suggests that he referred primarily to cases of pronounced disabling edema, which is of relatively low incidence in all the series reported. In our series, although edema of some degree was present in a high proportion of cases it was of clinical degree in only 30 per cent.

ETIOLOGY

As to the cause of the swelling of the arm, most authorities agree with Halsted's[2] original postulate that wound infection is the dominant factor in the early postoperative swelling. Marginal wound necrosis and the subdermal pooling of serum which is so

TABLE 1.—*Incidence of Postmastectomy Lymphedema (Review of 64 Cases at Cottage Hospital)*

	No. Cases	Per Cent
No edema	27	42
Subclinical* (1-2 cm.)	18	28
Clinical† (2+ cm.)	19	30
Total cases	64	100

*Arm circumference 1 to 2 cm. greater than other arm.
†Circumference more than 2 cm. greater than other arm.

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common in these cases predisposes to infection. Delayed edema is undoubtedly the result of occult lymphangitis in an arm in which lymph drainage is already severely handicapped. The following is a case in point.

CASE 1. A woman 54 years of age underwent right radical mastectomy in 1949. Two of the seven nodes examined were positive for metastasis. A number of enlarged tortuous veins of varicose type were present instead of an axillary vein. About six months later edema of the right arm first became visible, although there were no signs of infection about the hand or arm. The swelling gradually increased over the next two years, until the circumference of the right arm was 8 cm. greater than the left.

Postoperative radiation therapy is considered by many investigators to be a contributing cause of lymphedema. In our series a higher incidence of edema was noted in the irradiated group (Table 2). However, in two cases in which degree of swelling was greatest, no roentgen therapy had been given.

It has been suggested that the incidence of edema is related to the number of axillary lymph nodes removed in radical dissection, but this was not confirmed in our own study; and in animal experiments such an association does not occur when the lymphatics are severed over a wide area. It has been established that ligation of the axillary vein has no influence on swelling. Macdonald said that he routinely resects this vein to provide a more adequate removal of the regional lymphatics and has observed no additional predisposition to swelling in the arm. There appears to be universal agreement among surgeons that obesity is an important contributing factor because of the increased susceptibility to infection. In our series there were 12 patients who had an increase of more than 5 centimeters in circumference of the arm, and eight of the 12 were obese.

TREATMENT

The treatment of postmastectomy edema should be aimed at prevention. There is abundant evidence to indicate that infection, primary and secondary, is the foremost cause of the swollen arm. The surgeon should be careful to avoid the collection of serum in the axilla and beneath the skin flaps, for such pooling invites infection. The time-honored compression dressing and intermittent needle aspirations (when indicated) will usually serve this purpose. In recent years the use of continuous suction drainage of the wound has gained increasing popularity. We have used it for four to seven days in the last 25 consecutive cases and believe that it will result in a lower incidence of lymphedema. Of the 25 women so treated, seven were obese and five of them had clinical edema; but only one of the 18 who were not obese had edema.

Macdonald and Smith abandoned the use of dressings in the belief that the exposed dry wound is less vulnerable to infection than one swathed in cotton and gauze.

Necrotic tissue appearing in the margins of the sutured cutaneous flaps should be carefully excised. Halsted[2] recommended an "open wound" with secondary skin grafting to avoid the marginal necrosis which frequently resulted from undue tension on the sutured flaps. Holman[3] found no reduction in the incidence of edema in 71 cases in which grafting was done, and concluded that "primary skin grafting has no influence on the occurrence of swelling of the arm following radical mastectomy." Many surgeons advise the use of antibiotics at the first indication of infection or sign of swelling. Since 25 per cent of women undergoing conventional mastectomy for cancer may expect an objectionable degree of swelling in the arm, it would seem logical to use antibiotics prophylactically for the first few days. Delayed infection should likewise be treated vigorously with antibiotics, with foments for lymphangitis and elevation of the arm.

Most authorities reserve radiation therapy for patients with axillary metastasis. This undoubtedly explains the parallel between the incidence of arm swelling and axillary node involvement in the one instance and irradiation therapy in the other. A relationship of roentgen therapy to lymphedema is best explained as owing to radiodermatitis with secondary infection. The increasing use of methods of radiotherapy that cause minimal skin damage should greatly lessen this hazard.

Lymphedema of long standing is highly resistant to treatment. Numerous methods have been proposed for relief of the condition but all have been discarded, among them the Kondolean operation, the insertion of celloidin strips or laminated gelfoam into the subcutaneous tissues and the use of elastic bandages during the early postoperative weeks. We have had some encouragement in the use of Habif's method for alleviating swelling of long standing. The patient is put in hospital for five days and each day 50 cc. of a mixture of one ampoule hyaluronidase in normal saline solution is injected into the subcutaneous stratum of the entire arm, 5 cc. of the solution being introduced at each of ten sites 5 cm.

TABLE 2.—*Correlation of Various Etiologic Factors with Edema in 64 Cases of Postmastectomy Lymphedema*

Etiologic Factors	No. of Cases	Edema: Subclinical or None — No. of Cases	Edema: Clinical Edema — No. of Cases	Edema: Clinical Edema — Per Cent
Delayed healing	17	12	5	29
Radiation therapy	40	25	15	37
Axillary node involvement	35	21	14	40
Obesity	14	6	8	58

apart. The entire arm is then incorporated in a compression dressing and elevated for three hours. At the discretion of the physician the treatment is repeated in one to two months. All obese patients should be encouraged to reduce their body weight before beginning the treatment.

Should the present-day controversy between physicians who favor simple mastectomy plus radiation therapy for mammary carcinoma and those who favor radical operation be decided in favor of the former group, there undoubtedly would follow a sharp decline in the incidence of postmastectomy swollen arm. While two of fifteen patients who recently underwent simple mastectomy had mild edema in the arm afterward, in neither could it be classified as clinical. In one case persistent lymphedema developed following a breast biopsy in the upper outer quadrant.

DISCUSSION

Swollen arm continues to be one of the most disturbing problems associated with the treatment of mammary cancer. Often a woman cured of cancer is unhappy about the unsightliness of a permanently enlarged arm. A number of questions concerning postmastectomy lymphedema remain unanswered. One may build an excellent case for infection as the cause of swelling—and then observe a patient with extensive infection and delay in healing who recovers with no demonstrable enlargement of the arm. The same may be said for radiation therapy. While we are of the firm conviction that obesity tends to promote the development of edema, we can recall one most obese patient who had extensive marginal necrosis with secondary infection and in whom the wound was six months in healing but who one year later showed no significant enlargement of the related extremity.

The appearance in the recent literature of an increasing number of reports of lymphangiosarcoma developing in the lymphedematous arm following radical mastectomy deserves special mention. Stewart and Treves[6] first called attention to this tumor in 1948. They described six cases they had observed and collected reports of ten others from the literature. To date some thirty cases have been reported. Characteristically the lesion makes its appearance in a swollen arm a number of years after the operation. The shortest interval between mastectomy and the onset of lymphangiosarcoma in any of the published cases to date was six years. Typically the initial lesion is a mildly tender cutaneous or subcutaneous nodule, purplish in color, and usually appearing on the anterior surface of the upper arm. Satellite nodules appear early and may coalesce or become widely disseminated to involve the entire arm. The following is a report of such a case recently treated by us.

CASE 2. A 55-year-old housewife in 1946 complained of bloody discharge from the nipple, associated with a firm lump in the breast. In July 1946 left radical mastectomy for carcinoma was carried out. Eight axillary nodes were examined and all were found negative for tumor. Consequently no radiation therapy was given at that time. Swelling of the arm with slight disability soon developed. A stage of clinical edema of the arm was reached within a few months and it persisted. For the ensuing eight years the patient had no other complaints and continued to feel well. In 1954 a small indurated lump developed on the lateral aspect of the upper arm. It was non-tender and had a purplish center. This was excised on July 16, 1954, and was reported as lymphangiosarcoma. Later in the year a second such tumor appeared in the swollen arm. On December 30, 1954, radical excision of the subcutaneous tissues of the upper arm was done and a split-thickness skin graft was applied. At this time the circumference of the left arm was 10 cm. greater than that of the right arm. Radiation therapy was also applied to the swollen arm in an effort to discourage formation of new tumors. Another recurrent purple nodule became evident in the summer of 1956 and was followed shortly by an outbreak of dozens of similar rapidly growing tumors. In the early part of 1957 the arm developed further swelling, and finally nearly the whole arm was covered with draining, fetid tumor masses (Figure 1) re-

Figure 1.—Arm of patient in Case 2, nearly completely covered with draining tumor masses.

quiring several dressings each day and confining the patient to her home. Because there was no evidence of distant spread, a left shoulder girdle amputation was done on May 7, 1957, and the patient convalesced readily. She was temporarily rehabilitated by the amputation, but died of progressive malignant growth in December 1957.

In cases of this type rapid metastasis with fatal outcome is the rule. There has been but one case of five-year survival reported in the literature. Histologically the lesion resembles hemangiosarcoma. The closely spaced elongated spindle-shaped cells have poorly defined cell boundaries, a scant amount of cytoplasm and large ovoid vesicular nuclei. It is of special interest that while these tumors are apparently unrelated to mammary cancer they have only been seen in the lymphedematous arm after mastectomy for cancer and in no other type of extremity edema.

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REFERENCES

1. Haagensen, C. D.: Diseases of the Breast, W. B. Saunders Co., Philadelphia, 1956.

2. Halsted, W. S.: The swelling of the arm after operations for cancer of the breast, Bull. J. Hopkins Hosp., 32:309, 1921.

3. Holman, E., McSwain, B. O., and Beal, J. M.: Swelling of the upper extremity following mastectomy, Surgery 15: 757, 1944.

4. Lobb, A. W., and Harkins, H.: Postmastectomy swelling of the arm, West. J. of Surg. Gyn. and Obst., 57:550, 1949.

5. Macdonald, I., and Osman, K.: Postmastectomy lymphedema, Am. J. Surg. 90:281, 1955.

6. Stewart, F. W., and Treves, N.: Lymphangiosarcoma in postmastectomy lymphedema cancer, Cancer, 1:64, 1948.